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Modeling the Kerr effect in polymer-disordered liquid crystals[1]
LENA M. LOPATINA, JONATHAN V. SELINGER, Liquid Crystal Institute, Kent State University — In the Kerr effect, an electric field applied to an optically isotropic material induces orientational order and hence induces optical birefringence. Recently, many investigators have used the Kerr effect to develop liquid-crystal displays and other electro-optic devices that can operate at high speed and with no need for aligning substrates. This application requires a large and fairly temperature-independent Kerr coefficient. One approach to achieve this goal is by using liquid-crystal blue phases, perhaps with polymer stabilization. As an alternative approach, D.-K. Yang has suggested using a nematic phase within a disordered polymer network. This structure would be disordered and optically isotropic in the absence of a field, but it would develop order and birefringence under an applied field. To assess this approach, we perform Monte Carlo simulations of a nematic liquid crystal in a disordered polymer network, and calculate the response to an applied field. We compare the results with analytic studies of liquid crystals under quenched disorder and with experiments.

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